

DEPARTMENT OF TRANSPORTATION
OFFICE OF STRUCTURES
COMPUTER SERVICE

FRAME SYSTEM

INSTRUCTIONS FOR USERS

This service is a general plane frame analysis and design program with a large degree of flexibility and several specialized input features. The following list is a summary of some of the program's capabilities:

1. The frame members may be prismatic or non-prismatic.
2. Intermediate member hinges and cantilevers are accommodated.
3. Sidesway may be included.
4. Members must be orthogonal - girders are horizontal and columns are vertical.
5. Reduction of the negative moment due to support width may be obtained.
6. Moment and Shear diagrams can be produced in plotted form.
7. Loads may be given as applied forces or as fixed-end-moments.
8. Live Loads for a standard HS truck or any 3-axle load will be automatically generated.
9. Influence lines may be generated, and plots produced.
10. Live Loads for a 13-axle truck may be automatically generated.
11. Bent live loading may be generated. (Future release)
12. The frame can be designed or analyzed for prestress from a given cable path.

Since this program is for plane frames only, the user must be aware of the limitations of the analysis method. Factors such as curvature, torsion, axial and shear deformations,

skew, transverse distribution, and partial fixity are not considered in the program. Considerable judgement is required in deciding if a structure such as a skewed, curved box girder bridge with intermediate diaphragms should be analyzed as a plane frame. For this type of structure, programs such as STRUDL, CELL, CURVBRG, MUPDI or FINPLA may be better.

DATA PREPARATION

Data may be given directly from input forms, or via an existing input file. To create or modify a file for a frame system problem see the user instructions titled "Frame System Update."

The following input forms may be used to define a problem:

FRAME DESCRIPTION describes the frame. By itself, this data would produce a dead load analysis.

SUPERSTRUCTURE SECTIONS describes cross-section geometry. By itself this form will produce section properties. This data is normally used to supplement the frame description data. The section described by this form may be modified by submitting Section Properties by Parts with the same member no. and cross-section location.

SECTION PROPERTIES BY PARTS describes a section of a prismatic member or multiple sections of a non-prismatic member. By itself this form will produce section properties. This data is normally used to supplement the frame description data or the superstructures sections data.

LOAD DATA describes the loading conditions applied to the frame. It can only be used as a supplement to the frame description.

SUPERSTRUCTURE LIVE LOAD describes the live load condition to be applied to the frame. A multiple of the standard HS20-16 truck or a user designed 3-axle truck may be specified as the live load.

LIVE LOAD GENERATOR describes the multi-axle live load to be applied to the frame. Variations of the axle load and spacing may be obtained, or the program will default to a standard P-13 truck.

PRESTRESSED DATA describes the prestressing cable paths to be incorporated in the frame to resist the input loads.

COMMON INPUT

IDENT and accounting data are standard. See General Instructions 1-1. Problem may be any number, but it must be the same number for all data pertaining to the problem.

IDENT.				SOURCE		CHARGE		EXPENDITURE	SPECIAL DESIGNATION
DIST.	GR.	BATCH	PROB.	DIST.	UNIT	DIST.	UNIT	AUTHORIZATION	WHEN APPLICABLE
S/C 2091, 7310				S/C 2091					

UPDATE CODE AND LIVE NO. are input required by the "Frame System Update" program. This information is not needed by the Frame System program.

FRAME DESCRIPTION

Member No. must start with 1 and increase consecutively. Horizontal members must be numbered first. Up to 50 members may be analyzed for dead load. If the live load input form is used only 25 horizontal members are allowed. If prestress data is used only 15 horizontal members are allowed.

Update		Member No.	End Joint No.		End Condition Direction	Length ft.	Min. I ft ⁴	Hinge Location or Support Width ft	E ksi
C O D E	Line No.		Lt.	Rt.					
Dead Load		Unit		-K-		-C-		Recall	D.L.
Uniform	Wt.	Stiffness Factor		Carry Over Factor		Member	Reverse	Deflections	Sideway
k/ft.	pcf	Lt.	Rt.	Lt.	Rt.	R			S

END JOINT NUMBERS define the structural topology or connectivity. Each member is connected to two of the joints in the structure. For vertical members, the left end is assumed to be the bottom and the right end is

assumed to be the top. Joints must be numbered consecutively starting with 1. Up to nine members may meet at one joint except if Live Load data or Prestressed Data are included. Then only three members may meet at one joint.

END CONDITIONS describe the degree of freedom of the member at the joint.

C = Cantilevered (unsupported)

P = Pinned (Moment is released. Horizontal and vertical forces are continuous.)

R = Roller (Moment and Horizontal force is released.)

Please note that vertical forces, including uplift, can be transmitted thru both a pin and a roller. A roller at the end of a vertical member causes the member to act as a cantilever. (See Sidesway Restrictions). If no entry is made, the end condition is assumed to be fixed.

DIRECTION is assumed to be vertical unless a "G" or "H" is entered to indicate a girder or horizontal member.

LENGTH is the span length of the member from centerline of support to centerline of support.

MIN. I is the minimum moment of inertia. If the moment of inertia is entered here, then certain output features are not provided. If this entry is left blank, the required section properties must be provided by the "Superstructure Section" or "Section Properties by Parts" input forms.

HINGE LOCATIONS OR SUPPORT WIDTH define the hinge location or support width, depending on the entry in the "Direction" field. If a "G" or "H" is entered for direction, then a hinge location is defined, otherwise, a support width is defined. Hinge location is given as the distance in feet from the left support to the hinge centerline. The support is usually the bent cap width in feet or the column width in feet. This information is needed to obtain the moment reduction.

E, the modulus of elasticity, may be input or the user may accept the built-in defaults. Once an entry is made, E remains constant for all subsequent members until another entry is made. If no value is given, E defaults to two values. An E of 750 KSI is used for stiffness, deflections,

and prestress elastic shortening calculations. An E of 3000 KSI is used for sidesway calculations.

DEAD LOAD can be applied to the input frame by two methods.

UNIFORM describes a uniform load in kips/foot.

UNIT WT. describes the weight of the material to be used in calculating dead load. To use unit weight, the member must be described with Section Properties input. If no unit weight is given a value of zero is used. A separate value is required for each member described. Both a uniform load and a unit weight may be applied simultaneously. Dead loads applied to vertical members are assumed to act parallel to the longitudinal axis of the member. Supplemental loads may be added to the dead load analysis by giving "Load Data" with the trial no. 00. Supplemental loads such as barrier railings, sidewalks, and wearing surfaces may be applied as "Added Deal Load" by submitting "Load Data" input with the trial no. 01.

STIFFNESS AND CARRY OVER factors have to be given only when the member is non-prismatic and has not been defined by section properties input data. The factors may be given adjusted for pinned end conditions, if desired. The drawback of giving stiffness and carry over factors is that fixed end moments must be given for any loads applied to these members. Also, deflections cannot be calculated for these members.

MEMBER RECALL is available for members which have identical properties. These properties include Length, I, end condition, area, unit weight, and dead load. The only data required for the repetitive member is the member number, the end joint numbers, and the member number from which the data is to be obtained. If the member is to be flipped end for end enter "R" in the REVERSE column. Any other data given for the repetitive member, including section properties, is ignored. Data may not be recalled from a member which was generated by member recall.

DEFLECTIONS at the quarter points of all members will automatically be calculated for Dead Load (trial no. 00). If they are desired at some evenly spaced points other than the quarter points, enter the number of equal spaces under DEFLECTIONS. The entry needs to be made only once and may be made in the data for any member. Repeating the same entry in the data for several members is harmless, but two or more different entries will result in the last entry being

used for all members. In addition to the above, deflections will always be calculated at hinges and at the quarter points of the longer portion of a hinged member.

If correction for SIDESWAY is desired in the Dead Load analysis (trial no. 00), enter 'S' on the Frame Description input. The entry needs to be made only once and may be made in the data for any member. If correction for SIDESWAY is desired for any other trial, the entry must be made on Load Data input for that trial. This entry needs to be made only once per trial and may be made in the data for any line of the trial.

SIDESWAY DIAGNOSTICS, if any, are reported following the Fixed End Moments of the trial in which SIDESWAY was first requested.

If Sidesway Diagnostics are not present, the result of swaying the frame one inch to the right is reported in the form of Vertical member shears and end moments. If the structure contains hinges, these results are obtained by deflecting each frame separately. (The whole structure is not deflected simultaneously.)

Page headings will indicate whether sidesway was considered. If Sidesway Diagnostics are present, the heading will indicate that diagnostics are present and sidesway was not considered in analysis.

Sidesway Assumptions:

1. Hinges transfer vertical, but not horizontal forces.
2. Rollers resist vertical forces.

Sidesway Restrictions:

1. The structure must be a single story, plane, rectangular frame.
2. Ends of intermediate horizontal members may not be a roller or cantilever.
3. An end horizontal member which has a roller or cantilever, must be the only member at that joint.
4. Vertical members cannot be cantilevered.
5. Rollers are permitted at the right (top) end of vertical members, but not at the left (bottom) end.

SUPERSTRUCTURE SECTIONS

Normally this input option is used to supplement the frame description data, producing section and member properties. It may also be used as a stand alone submittal, producing just section properties. In either case, the section described may be modified by inputting section properties by parts data with the same member no. and cross section location.

UPDATE		MEMBER NO.	CROSS SECTION LOCATION (FT)	RECALL	REF. PT. COORD.		S.S. DATA		SLAB DATA	
CODE	LINE NO.				X (FT)	Y (FT)	WIDTH E.D.-E.D. (FT.)	DEPTH (FT.)	TOP THICK. (IN.)	BOTTOM THICK. (IN.)

The MEMBER NO. and CROSS SECTION LOCATION identify and locate the section from the left end of the member. Both must be repeated on each line used to describe the section.

Generally, the MEMBER NO. will correspond to that of a Frame Description member. The exception is that if the member number is zero (and an arbitrary Location given), section properties alone are calculated, which allows building sections initially, storing the results, and recalling them when building members.

If the member is prismatic, only one section need be described. Its CROSS SECTION LOCATION may be zero if the member length is defined in the Frame Description. Otherwise, the location of this section must define the member length.

When describing a non-prismatic member, the resulting I diagram is one which varies as a straight line between the sections given. Therefore, the number of sections needed to describe the member depends on how the moment of inertia varies. The CROSS SECTION LOCATION of the first section would be zero. The last section location would equal the member length used in calculating the stiffness and carryover factors. A maximum of 50 sections per member is allowed.

For both prismatic and non-prismatic members, if the member length given in the frame description does not agree with the length defined by the last cross section location, the difference is resolved as follows. The length defined by the last cross section location is used to calculate member properties. The length given by the frame description is used to calculate fixed-end-moments.

The section properties that have been calculated for a given member no. and cross section location may be saved for future use. This is done by entering a number from 1 to 99 under STORE. Only one entry under STORE is needed for each cross section location even when using both the superstructure sections form and the section properties by parts form.

RECALL data for use in subsequent sections by entering the number which was assigned to store the data. Section properties are calculated in order of member no. and cross section location. Recall is only available on a stored value from a member no. and cross section location whose section properties have already been calculated. More than one recall may be made per section. The recalled data may be modified by adding or subtracting parts, provided that the X-Y coordinate system is on the same reference datum for both sections. The SIGN field cannot be applied to the data recalled. Sections may be recalled within and between problems, but not between batches.

WIDTH and DEPTH of the superstructure must be given. The width is measured from edge of deck to edge of deck and the depth is measured from top of deck to bottom of soffit. The depth must also be measured from the reference point.

TOP and BOTTOM SLAB THICKNESS must be given, except for T-beam sections, in which case the bottom slab is omitted.

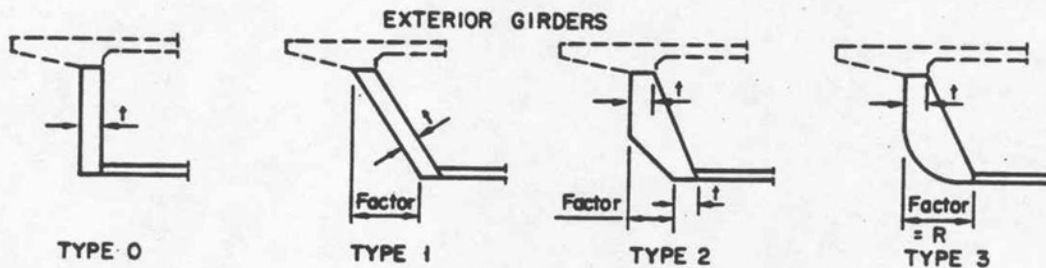
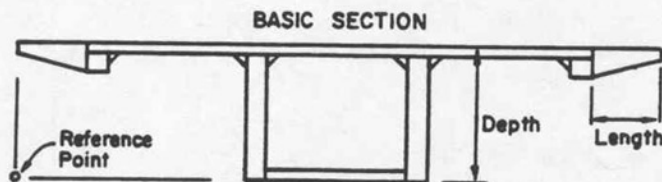
INT. GIRDERS			EXTERIOR GIRDERS						OVERHANGS						
			LEFT			RIGHT			LEFT			RIGHT			
NUMBER (INT. ONLY)	WEB THICK. (IN.)	TYPE	WEB THICK. (IN.)	FACTOR (FT.)		TYPE	WEB THICK. (IN.)	FACTOR (FT.)	LENGTH (FT.)	EXT. THICK. (IN.)	INT. THICK. (IN.)	LENGTH (FT.)	EXT. THICK. (IN.)	INT. THICK. (IN.)	STORE

INT. GIRDERS NUMBER and WEB THICKNESS is optional input. Omit both entries if the section consists of exterior girders only.

EXTERIOR GIRDERS TYPE is shown on a sketch on the input form. The exterior girder may be omitted by entering it as a Type 9. Type 0 is assumed if no type is given.

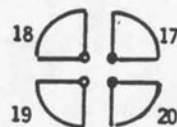
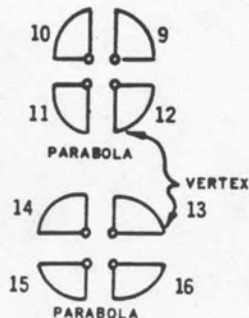
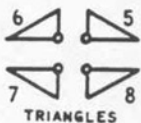
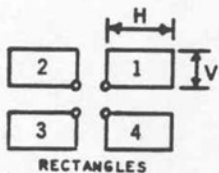
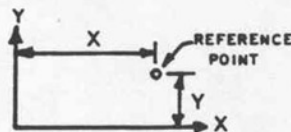
WEB THICKNESS is measured perpendicular to the girder face and is assumed to be equal to the interior girder thickness if omitted. The exterior girder FACTOR must be given for types 1, 2 and 3 to the nearest .01 foot.

Standard 4" fillets are assumed as shown.

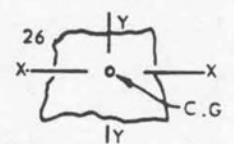
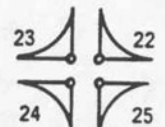
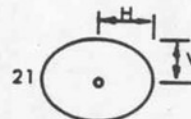


TYPE 9 MEANS NO EXTERIOR GIRDER

PART CODES



CIRCLES if $V = H$ or ELLIPSES if $V \neq H$



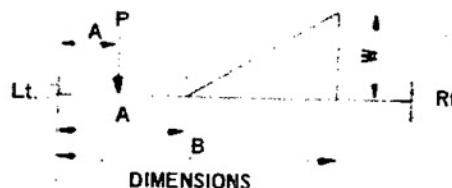
ANY SHAPE

of trial no. 00 loads. Trial no. 1 is assumed to be added dead loads, i.e., barrier railing, wearing surface, signs. Added dead load is any loading which is placed on a frame in its final condition. This condition usually has an effect only on prestressed frames.

MEMBER NO. refer to the member to which the load is applied. Any or all members may be loaded in a given trial.

* CODE

L=Max. W on left
R=Max. W on right
U=Uniform Load
P=Point Load



Trial No.		Member No.		Loads		FEMs*		Deflections Sidesway S	Comments
±		±		W or P k/ft or k	Code* ft.	A ft.	B ft.		
Left	Right	Left	Right						
ft - k	ft - k	ft - k	ft - k						

If the dimensions "A" and "B" happen to be greater than the member length, the member length is used and a warning message is printed.

Enter an 'S' in the sidesway column to obtain sideswayed results for all loads of a given trial. Only one entry per trial is required.

Up to 17 characters of COMMENTS may be made per line on which other data (trial no., etc.) are given. If a single comment covers more than one line, the comment lines may not print in order.

SUPERSTRUCTURE LIVE LOAD

This feature uses two types of input data, MEMBER DATA and LIVE LOAD DATA. Combinations of both or either by itself may be used to produce horizontal member moment and shear envelopes, and the maximum vertical member moments and reactions due to a HS20-44 AASHTO or a multi-axle live loading as well as alternative, standard construction, and sidewalk live loadings. Upon request, influence line ordinates will also be produced.

Plotted results may be obtained for the dead load and live load moment and shear diagrams and for the influence line diagram. All plots must start with the first member in the frame and will continue to the last member.

INFLUENCE LINES, both ordinates and plots, may be obtained by entering a check mark (✓) in the proper box on the input form. Member No. 1 and Number of Live Load Lanes must also be given.

Separate plots will be produced for each horizontal member. Each plot frame will contain the influence lines for the .2L, .4L, .5L, .6L, .8L and 1.0L positions along a particular member. Each influence line is delineated by a separate line code shown on the plot.

MOMENT and SHEAR plotted results may be obtained by entering a code shown in the table below. To obtain dead load plots only enter Member No. 1 and the plot code, but leave the Number of Live Loads blank. To obtain plots with live loads, the Number of Live Load Lanes as well as Member No. 1 and the plot code must be input.

RESISTING MOMENT OF UNIT STEEL values may be given and will cause tick marks to appear on the moment diagrams.

Entry Code	Program Response
Blank or Ø	No plot
1	Plot Moment & Shear Diagram for DL+LL and DL.
2	Plot Moment diagram for DL+LL and DL.
3	Plot Shear diagram for DL+LL and DL.
4	Plot Moment & Shear diagram for DL only.
5	Plot Moment diagram for DL only.
6	Plot shear diagram for DL only.
7	Plot Moment & Shear diagram for LL only.
8	Plot Moment diagram for LL only.
9	Plot Shear diagram for LL only.

The minimum input data required to produce results due to a HS20-44 AASHTO or multi-axle live loading is the NUMBER of LIVE LOAD LANES applied to the horizontal members of the frame. Although this data may be given as MEMBER and/or LIVE LOAD DATA, it will normally be given as MEMBER DATA. Reduction in the number of substructure lanes due to improbable coincident maximum loading is not performed by this feature, but the reduced data may be given by the user.

Unless otherwise specified, AASHTO IMPACT FACTORS will be included in the calculations and therefore, should not be included in the NUMBER of LIVE LOAD LANES.

Superstructure Live Load input data must be accompanied by Frame Description input data. Superstructure Sections, Section Properties by Parts, and the Load Data input options may also be used, producing results as described in earlier instructions.

When the Superstructure Live Load feature is used, the frame is subject to the following limitations:

1. The structure must be a rectangular single story plane frame.
2. Horizontal members must be numbered consecutively starting with 01, up to a maximum of 25.
3. Cantilevered members are not allowed.

MEMBER DATA

MEMBER DATA											
Member No.	Number of Live Load Lanes				Plot Data					Influence Lines	COMMENTS
	Superstructure		Substructure		Resisting Moment of Unit Steel		Moment & Shear				
	Lt. End	Rt. End	Lt.	Rt.	Positive	Negative					

When using this input option, enter the horizontal MEMBER No. to which the line of data corresponds.

The NUMBER of LIVE LOAD LANES is classified by results that pertain to the SUPERSTRUCTURE and SUBSTRUCTURE. They may be varied linearly from the LT. END to the RT. END of the member. When given as MEMBER DATA, the NUMBER OF LIVE LOAD LANES must be given for the LT. END of SUPERSTRUCTURE MEMBER NO. 01. SUBSTRUCTURE MEMBER 01 defaults to 1.0 L. L. Lane when left blank. In both cases, when an entry is made, it is assumed to be constant for both ends of all subsequent members until another entry is made. When the value for the LT. END of a member is not given, it is assumed to equal that of the RT. END of the previous member. The value at the RT. END of a member, when not given, is assumed to equal that of the LT. END of the next member if it is given. Otherwise, the value at the RT. END is assumed to equal that of the LT. END of the same member.

A check mark under P-13 will cause the program to generate live loads as follows for one live load lane.

Each axle of a P-5 truck is placed at each 10th point of each span. Axles are arranged for the truck moving in both directions.

One heavy axle of the P-Series truck is added and the above procedure repeated. This process continues until the P-13 truck is checked.

LIVE LOAD DATA

L.L. No.	Truck -- (1 Lane)					Lane -- (1 Lane)			No Impact ✓	Number of Live Load Lanes
	P ₁ Kips	D ₁ Ft.	P ₂ Kips	D ₂ Ft.	P ₃ Kips	Uniform Kips/ft.	Moment Rider Kips	Shear Rider Kips		
1										
2										
3										

This input option need be used only when the LIVE LOAD DATA consists of something other than the standard HS20-44 AASHTO live loading plus impact, provided that the NUMBER of LIVE LOAD LANES is given as MEMBER DATA.

If the TRUCK and LANE data for L. L. No. 1 is not given, HS20-44 AASHTO loading (without alternative) is assumed. If either or both is given for L. L. No. 1, it replaces the HS20-44 loading. Alternative loading if required, should be entered as described below.

TRUCK and/or LANE data entries for L. L. No.'s 2 or 3 produce separate results in addition to L. L. No. 1.

The TRUCK load for one lane may consist of one, two or three axles. It is defined by entering the axle loads P₁, P₂, and P₃ (0.1 kips) and their spacing D₁ and D₂ (0.1 ft).

The LANE load for one lane may consist of a UNIFORM load (kips/ft) and/or MOMENT RIDER (0.1 kips) and/or SHEAR RIDER (0.1 kips).

Enter a check mark (✓) when NO IMPACT is desired for the particular L. L. NO.

When the NUMBER of LIVE LOAD LANES is given as LIVE LOAD DATA, it overrides that given as MEMBER DATA. It is constant for all horizontal members and used both for SUPERSTRUCTURE and SUBSTRUCTURE results.

Up to 22 characters of COMMENTS may be made per L. L. No. on which other data is given. When no data is entered for L. L. NO. 1, the comment defaults to 'HS20-44 AASHTO LOADING WITHOUT ALTERNATIVE.'

LIVE LOAD GENERATOR

The live load generator input form is similar to the superstructure Live Load Form. Entries on this form will allow AREA railroad or special live load description. Entries in the "Member Data" portion of the form describes the number of lanes that will be loaded with the special truck described on the "Live Load Data" portion of the form.

MEMBER DATA

Update		Member No.	Number of Live Load Lanes				Plot Date				Moment & Shear Scale	Influence lines
C O D E	Line No.		Superstructure		Substructure		Resisting Moment of Unit Steel					
			Lt. End	Rt. End	Lt.	Rt.	Positive	Negative				

LIVE LOAD DATA

Update		LL No.	Multi Axle Live Loading							
C O D E	Line No.		P _N	D ₁	P _{N+1}	D ₂	P _{N+2}	D ₃	P _{N+3}	D ₄
			Kips	Ft.	Kips	Ft.	Kips	Ft.	Kips	Ft.
		4								
		4								

					OVER LOAD		Cooper Loading	NO IMPACT ✓	COMBINE	CARD CONTROL
P N+4	D 5	P N+5	D 6	P N+6	Color Code	No of Axles				
Kips	Ft.	Kips	Ft.	Kips						
										1
										2

Live load data is supplied for each axle of the proposed special vehicle. Axle loads in kips and axle spacing in feet may be continued for a maximum of two lines per live load number.

OVERLOAD, COOPER LOADING, and COMBINE are data entry areas reserved for future enhancements.

Impact will be considered unless a check mark (✓) is provided in the "NO IMPACT" field.

LIVE LOAD RESULTS

LIVE LOAD DIAGNOSTICS, if present, will indicate that the live load limitations placed on the frame have been violated or an error was made in the superstructure live load input data.

SUPERSTRUCTURE LIVE LOAD input data is reported as given or assumed.

For each L. L. NO. for which LIVE LOAD DATA was given or assumed, the following results are reported for the tenth points of the horizontal members.

1. NEGATIVE LIVE LOAD MOMENT ENVELOPE AND ASSOCIATED SHEARS. HORIZONTAL MEMBER STRESSES - TOP AND BOTTOM FIBRE.
2. DEAD LOAD PLUS NEGATIVE LIVE LOAD MOMENT ENVELOPE. HORIZONTAL MEMBER STRESSES - TOP AND BOTTOM FIBRE.

3. POSITIVE LIVE LOAD MOMENT ENVELOPE AND ASSOCIATED SHEARS.
4. DEAD LOAD PLUS POSITIVE LIVE LOAD MOMENT ENVELOPE. HORIZONTAL MEMBER STRESSES - TOP AND BOTTOM FIBRE.
5. LIVE LOAD SHEAR ENVELOPES AND ASSOCIATED MOMENTS. (POSITIVE, NEGATIVE AND RANGE)
6. DEAD LOAD PLUS LIVE LOAD SHEAR ENVELOPES. (POSITIVE AND NEGATIVE)

The dead load plus live load envelopes are reported only if the dead load analysis was performed with all horizontal members loaded. The dead load results are obtained from Trial No. 0 of the basic system as described in earlier instructions.

Be careful when using the dead load plus live load shear envelopes. The dead load shears are computed, and only one ordinate is saved at each tenth point. Therefore, when the dead load includes concentrated loads, the abrupt steps are not shown. If the load is exactly at a tenth point, only the most positive value is retained.

LIVE LOAD SUPPORT RESULTS are also reported for each L. L. NO. for which LIVE LOAD DATA was given or assumed. Dead load is not included. Impact is included, unless otherwise specified.

The MAX. POSITIVE AND NEGATIVE (uplift) AXIAL LOAD at each SUPPORT or TOP of VERTICAL MEMBER is reported, as is TOP and BOTTOM vertical member moments created by the same loading.

The MAX. POSITIVE and NEGATIVE LONGITUDINAL MOMENT at the TOP of each VERTICAL MEMBER is reported, as is the AXIAL LOAD and BOTTOM vertical member moment created by the same loading.

Beam sign convention is used for all live load results. Units are kips and feet.

INFLUENCE LINE RESULTS

When requested, the following types of INFLUENCE LINES are reported. Ordinates for each are given at the tenth points and at hinges.

The INFLUENCE LINES for GIRDER MOMENT, reported for each tenth point of the horizontal members, are extended two spans on each side of the span with the influence point.

The INFLUENCE LINES for GIRDER SHEAR, reported for the left end of each horizontal member, are extended two spans on each side of the span with the influence point. From this line, the influence line for shear at any point in that member may be constructed.

The INFLUENCE LINES for REACTION at TOP of COLUMN (or support if no column is present) are extended two spans on each side of the column.

The INFLUENCE LINES for MOMENT at TOP OF COLUMN are extended two spans on each side of the column.

PRESTRESSED DATA

The prestressed data form is used to describe a prestressed cable path which is to be applied to a previously described frame and its dead load, added dead load and live load. The prestressing may be part length, and/or multiple tendon. Input, as described below, consists of three types of information: 1) orientation, 2) cable path geometry, and 3) specifications.

TRIAL NO. is the number of the input cable path configuration. Different cable path geometry or specifications can be tried in a single submittal by varying the trial number.

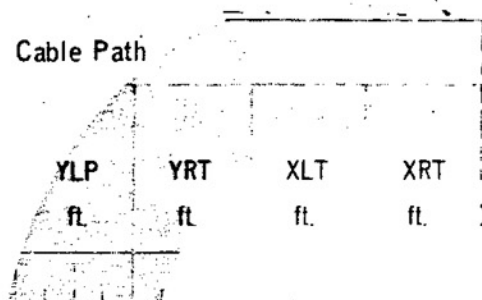
FRAME NO. is the number of structural frame. A frame is defined as the area between hinge and/or end supports. For example, an eight span structure with 2 intermediate hinges would have 3 frames.

PATH NO. is a number or letter used to identify the various cable paths in a multiple tendon prestressed frame. The effects of the multiple paths in the same trial and frame are all added together. When multiple paths are defined, only one path may have an unknown jacking force.

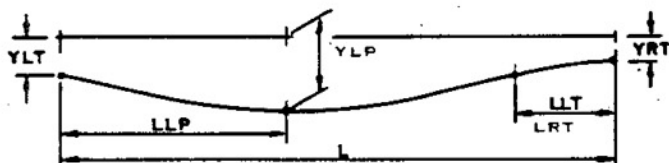
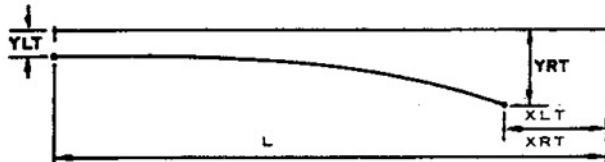
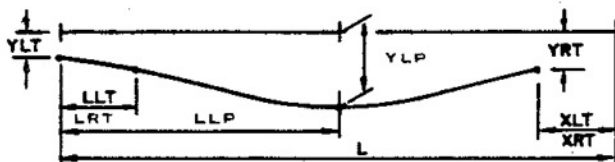
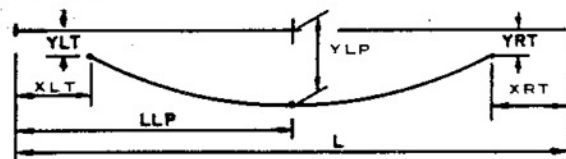
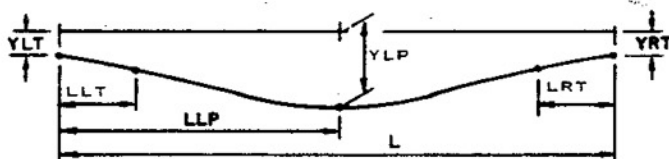
MEMBER NO. is the member for which prestress information is being input. The member number is the same as is shown on the Frame Description input form. Up to 15 horizontal members can be input if prestressed input is submitted. Member numbers need not begin with 1.

Trial No.	Frame No.	Path No.	Member No.	LLT	LLP	LRT	YLT	YLP	YRT	XLT	XRT
				%	%	%	ft.	ft.	ft.	ft.	ft.

Cable Path



The cable path geometry is described by defining a series of four parabolic sections per span. The end of cable locations must also be given.



LLT, LLP, and LRT are the horizontal locations of the points of inflection of the cable. The abbreviations, LLT; LLP and LRT mean "Length to left point", "Length to low point" and "Length to right point." The values to be input are in percent of span, accurate to the nearest 1%. Note that the illustrated path configurations or the illustrated configurations reversed are the only allowable paths. LLP is always the length from the left end of the span to the low point.

YLT, YLP and YRT are the vertical offsets from the top of the deck to the C.G. of the prestress force as shown on the sketch. The abbreviations YLT, YLP and YRT mean "Offset to left point", "Offset to low point", and "Offset to right point." The values are input to the nearest 0.01 of a foot.

XLT and XRT are the horizontal distances from the end of span to the ends of the cable path. The abbreviations XLT and XRT, mean "distance to left end of cable," and "distance to right end of cable."